

Hybrid Aerogel-MLI Insulation System for Cryogenic Storage in Space Applications, Phase II

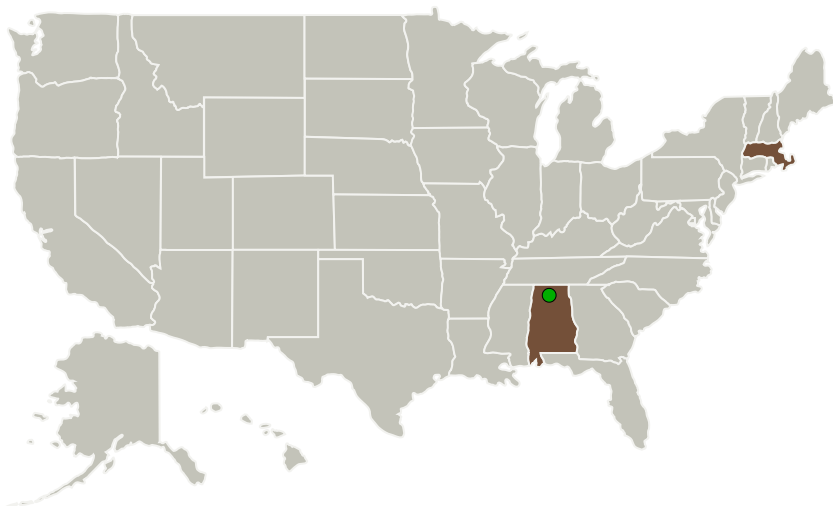
Completed Technology Project (2011 - 2013)



Project Introduction

The future of the NASA space program includes longer and more invasive missions into space. Long duration storage of large quantities of cryogenic fluids for propulsion, power, and life-support is an essential requirement for these missions. Efficient and reliable insulation of the cryogenic fluids is key to the success of long missions into space. Aspen Aerogels successfully developed a novel low-density hybrid insulation system composed of multiple layers of low density, low dust superhydrophobic aerogels and multilayer insulation (MLI) for cryogenic fluid management. The hybrid aerogel/MLI insulation system outperformed MLI system at cryogenic temperatures and across a range of vacuum conditions, including high vacuum. This exceptional performance is considered a new breakthrough in high vacuum cryogenic thermal insulation materials. During the Phase II Program, further refinement and qualification testing of the low-density aerogel material will be performed in order to be used in real world applications. Liquid oxygen (LOX) compatibility of the aerogel material and a cost assessment will also be investigated. For qualification of this novel insulation system for future NASA in-space programs, extensive work will be dedicated to large-scale testing and performance evaluation of the refined hybrid aerogel/MLI insulation system.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Aspen Aerogels, Inc.	Lead Organization	Industry	Northborough, Massachusetts
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Massachusetts

Project Transitions

▶ **June 2011:** Project Start

✓ **August 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138962>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Aspen Aerogels, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

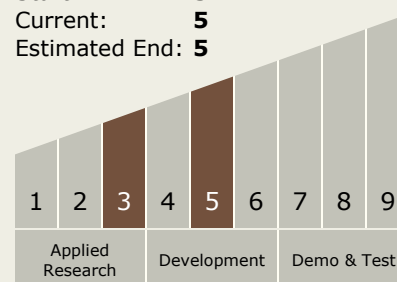
Carlos Torrez

Principal Investigator:

Redouane Begag

Technology Maturity (TRL)

Start: 3
Current: 5
Estimated End: 5



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.2 Electric Space Propulsion
 - └ TX01.2.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System